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Management of severe malaria in children under 5 years of age in private and public health facilities in Cross River State, southeastern Nigeria: an audit of current practices

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Friday Odey[1,2]
Ekpereonne Esu[1,3]
Emmanuel Effa[1,4]
Ekong Udoh[1,2]
Olabisi Oduwole[1]
Moriam Chibuzor[1]
Angela Oyo-Ita[1,5]
Martin Meremikwu[1,2]

[1]Calabar Institute of Tropical Diseases Research and Prevention, University of Calabar Teaching Hospital, Calabar, Nigeria; [2]Department of Pediatrics, College of Medical Sciences, University of Calabar, Calabar, Nigeria; [3]Department of Public Health, College of Medical Sciences, University of Calabar, Calabar, Nigeria; [4]Department of Internal Medicine, College of Medical Sciences, University of Calabar, Calabar, Nigeria; [5]Department of Community Medicine, College of Medical Sciences, University of Calabar, Calabar, Nigeria

Purpose: The policy for the treatment of severe malaria in Nigeria was revised in June 2011 to parenteral artesunate followed by a full course of artemisinin-based combination therapy. This audit assesses how well health care providers in public and private facilities comply with the current national treatment guidelines.

Patients and methods: A clinical audit was conducted on the patient case records of children below 5 years of age who were managed for severe malaria in Cross River State, southeastern Nigeria. Multi-staged sampling was used to select the secondary health facilities for the exercise. The audit was conducted between January 2012 and March 2012.

Results: A total of 119 cases of severe malaria in children under 5 were assessed in three public and 12 private facilities. Light microscopy was more frequently used in confirming the diagnosis of malaria than rapid diagnostic tests. Malaria smear was more commonly done in private than public facilities ($P = 0.02$). A majority of patients (81%) received parenteral antimalaria drugs, with intramuscular artemether (60.4%) being the most commonly prescribed. Only 58% and 47% of cases received correct doses of parenteral drugs in public and private facilities, respectively. More public facilities prescribed oral artemisinin-based combination therapy after discontinuation of parenteral drugs ($P = 0.02$).

Conclusion: There is need to improve the case management of severe malaria in both public and private facilities in the state. Health workers should be regularly updated on the amended guidelines for the management of severe malaria. We recommend the provision of rapid diagnostic test kits to health facilities.

Keywords: severe malaria, case management, clinical audit, resource-limited setting

Background

It is estimated that 216 million episodes of malaria occurred globally in 2010 with resultant 655,000 deaths. About 91% of malaria burden in that year occurred in Africa while 86% of the global malaria death was in children under five years of age.[1] The global estimate of malaria incidence is reported to have dropped by 17% and malaria deaths by 26% between 2000 and 2011 but the improvement in statistics is not distributed evenly across regions of the world.[1]

In Nigeria, malaria remains the country's most important health problem.[2] It accounts for 25% of infant mortality, 30% of under-5 mortality and 11% of maternal mortality.[2] Between 2000 and 2010, at least 50% of the population had one episode of malaria per year, while children below 5 years had two to four attacks.[3] Malaria also accounts for about 60% of all outpatient clinic attendances and 30% of all hospital admissions.

Correspondence: Martin Meremikwu
Department of Pediatrics, University of Calabar, PO Box 3134, GPO, Calabar, Nigeria
Tel +23 480 3674 2377
Email mmeremiku@yahoo.co.uk

It is estimated that malaria is responsible for nearly 110 million clinical cases in the country with an estimated 300,000 deaths per year.[2] Malaria infections cost the economy as much as 132 billion Naira (£530 million) per annum.[2,4]

In children less than 5 years old, a delay in accessing treatment for uncomplicated malaria beyond 48 hours from the onset of symptoms increases fatality;[5,6] hence, the Roll Back Malaria initiative recommends early diagnosis and prompt treatment with an artemisinin-based combination therapy (ACT) within 24 hours of the onset of symptoms.[7] The mortality from severe malaria in young children usually exceeds 10%, and preschool children represent a particularly vulnerable group due to their limited immunity against infection.[8,9]

The management of severe malaria remains challenging, mainly due to the fact that it does not only depend on the use of effective antimalaria drugs but also the use of effective parenteral antimalaria drugs, but it also depends on relatively cost-intensive supportive measures, the availability of highly skilled personnel,[10] functional referral systems, blood transfusion services, good infrastructure, and adequate organization of hospital services.[11]

Parenteral quinine had been the first-line treatment for severe malaria in Nigeria until June 2011 when the policy was revised to intravenous artesunate as a first-line antimalarial.[12] The current national treatment guidelines require that the diagnosis of malaria be confirmed parasitologically either by light microscopy or rapid diagnostic test (RDT) in settings where light microscopy is not feasible before treatment with parenteral artesunate (alternatives are either parenteral quinine or artemether), which is to be followed with a full course of the recommended ACT.[3]

The Cross River State government in collaboration with development partners has made consistent efforts in the control of malaria through scaling up preventive interventions and case management.[13] Between 2008 and 2010, the proportion of Nigerian children under the age of 5 years with suspected malaria who received treatment within 24 hours with an ACT increased from 7% to 12%.[13] However, a recent report from the study area suggested that several factors were militating against the uptake of the recommended ACTs by children with malaria in the study area.[14]

There is limited information on the management practices for severe malaria in children under 5 years old. To understand the current practice, an audit of the management of severe malaria in children under 5 was conducted in public and private facilities in Cross River State, southeastern Nigeria.

Methods

Study setting

The audit was conducted on medical records in secondary health facilities (both public and private) situated in rural and urban areas of Cross River State, Nigeria between January 2012 and March 2012. The study area is located within the tropical rainforest belt of southeastern Nigeria and has an annual rainfall of 2500 to 3500 millimeters. Malaria transmission is intense and perennial in this area.[2]

Sampling methods

Multi-staged sampling was used to select the facilities to be audited. Cross River State is comprised of three senatorial districts, each made up of 5–7 local government areas (LGAs). One LGA was selected in each senatorial district by simple random sampling. A list of all the registered health facilities in the state was obtained from the State Ministry of Health. At the LGA level, the health facilities were stratified into public (ie, government-owned) and privately owned facilities. There was only one general hospital in each of the sampled LGAs and they were audited. The private hospitals/clinics were randomly selected from the list of registered facilities obtained from the health ministry. Outside of the state headquarters, the four biggest private hospitals/clinics in each LGA were chosen for the exercise. Thus, in each LGA, the medical treatment records of only the general hospital and four private hospitals were audited. Data were collected from three of the 15 public (general) hospitals and 12 of over 40 functional private hospitals/clinics across the state. In each facility, treatment records of the last 20 cases of severe malaria in children under 5 managed 3–6 months prior to the exercise were audited. The definition of severe malaria was based on the revised World Health Organization criteria.[9]

Data collection

Junior medical doctors, nurses, community health officers, and laboratory scientists were trained on the audit procedure. They worked concurrently to extract data from patient case files in the selected facilities using pretested data extraction forms under the supervision of experienced clinicians. Pediatricians who were members of the team determined the appropriateness of the dosages of drugs based on the national guidelines. All case files of children under 5 with the diagnosis of severe malaria were retrieved from the medical records of the facilities and reviewed. Data obtained include patient demographics, clinical features, malaria tests, antimalarial drugs, and supportive treatment prescribed. Treatment regimen was classified as either appropriate (correct dose of

intravenous artesunate) or inappropriate (under- or overdose of intravenous artesunate).

Ethical considerations

The Cross River State Health Research Ethics Committee reviewed and approved the proposal for the study. Consent was obtained from the management of all selected facilities prior to data collection. Data that could identify the patient, such as names, were not collected. Malaria is not a stigma-related disease.

Data management and analysis

Data from all LGAs were combined, and descriptive analysis was done based on the ownership of the facilities (public or private). Data entry and analysis were done with Microsoft Excel 2007 (Microsoft Corporation, Redmond, WA, USA). Data are presented as proportions and frequencies. Z-scores were used to compare differences between public and private facilities.

Results

General patient information

A total of 119 cases of severe malaria in under-fives were assessed across 15 secondary health facilities. The intention was to review 20 cases of severe malaria in each facility; however, most of the facilities treated less than 20 cases in the period covered by the audit. Table 1 shows the documentation of the basic patient information as recorded in the case files.

Table 1 Types of general patient information collected

	Patients (%)			*P*-value[a]
	Public	Private	Total	
Number of case records studied	21 (17.6)	98 (82.4)	119 (100)	
Number of health facilities	3 (20)	12 (80)	15 (100)	
Age recorded?				
Yes	20 (95.2)	94 (95.9)	114 (95.8)	0.8849
No	1 (4.8)	4 (4.1)	5 (4.2)	
Sex recorded?				
Yes	21 (100)	93 (94.9)	114 (95.8)	0.3009
No	–	5 (5.1)	5 (4.2)	
Weight recorded?				
Yes	15 (71.4)	48 (49)	63 (52.9)	0.062
No	6 (28.6)	50 (51)	56 (47.1)	
Recorded temperature ≥ 39°C?				
Yes	13 (61.9)	46 (46.9)	59 (49.6)	0.2122
No	8 (39.1)	43 (43.9)	51 (42.9)	
Unclear	–	9 (9.2)	9 (7.5)	

Note: [a]Z-test for two-sample proportions.

Clinical presentation

The common symptoms documented among children under 5 with severe malaria were repeated vomiting (47.6%) and convulsions (33.3%) in the public facilities, and repeated vomiting (57.1%) and extreme weakness (53.1%, $P = 0.001$) in private facilities. For extreme weakness, there was a statistically significant difference between public and private facilities ($P = 0.001$). A general physical examination was recorded for all of the patients in public facilities and in 68% of those seen in private facilities. Moderate to severe pallor was the commonest clinical sign recorded and it was more common among patients seen in public facilities (71.4%) than in private facilities (40.8%). Jaundice was the next common physical sign recorded in both public (33.3%) and private (21.4%) facilities.

Laboratory investigations

A malaria smear was requested for 85.7% of patients in public and 75.5% of those in private facilities. Overall, smears for the malaria parasite were ordered in 77.3% of the patients but results of the test were recorded in 67.2% of them (Table 2). Microscopy was the main modality of confirming a malaria diagnosis and the difference between the number of tests conducted in public and private facilities was significant ($P = 0.022$). RDT was done in 16.3% of patients in private facilities. Overall, packed cell volume (PCV) or hemoglobin (Hb) estimations were requested in 72.3% of cases and done in 56.3%. The difference in request for PCV or Hb between the private and public health facilities was not statistically significant. The prevalence of moderate to severe anemia (PCV $< 21\%$ or Hb < 7 g/dL) in patients with severe malaria was 23.6%. Those with severe anemia (PCV $\leq 15\%$ or Hb < 7 g/dL) were given blood transfusions. There was no significant difference in the number of blood transfusions administered between public and private facilities ($P = 0.18$).

Treatment received by patients

Most patients (81%) were treated with parenteral antimalaria drugs (Table 3). Determination of the appropriate dosage was based on either the patients' measured weight or the weight estimated from the age in line with the national policy.[3] Appropriate dosages were prescribed for 58% of patients in public and about 47% in private facilities. More patients in public facilities had a full course of therapy of oral ACT after discontinuing parenteral drugs than in private facilities ($P = 0.02$).

Table 2 Laboratory investigations undertaken on patients

Laboratory test	Patients n (%)			*P*-value[a]
	Public	Private	Total	
Malaria blood smear ordered by clinician?				
Yes	18 (85.7)	74 (75.5)	92 (77.3)	0.3112
No	3 (14.3)	24 (24.5)	27 (22.7)	
Malaria blood smear done?[b]				
Yes	13 (72.2)	67 (90.5)	80 (67.2)	0.0224
No	5 (27.8)	7 (9.5)	12 (13)	
Malaria RDT used?				
Yes	1 (4.8)	16 (16.3)	17 (14.3)	0.1715
No	20 (95.2)	82 (83.7)	102 (85.7)	
PCV or HB requested?				
Yes	18 (85.7)	68 (69.4)	86 (72.3)	0.1299
No	3 (14.3)	30 (30.6)	33 (27.7)	
PCV or HB done?				
Yes	9 (42.9)	58 (59.2)	67 (56.3)	0.1717
No	12 (57.1)	40 (40.8)	52 (43.7)	
Moderate/severe anemia				
Yes	7 (33.3)	21 (21.4)	28 (23.6)	0.2431
No	4 (19.1)	54 (55.1)	58 (48.7)	
Unclear	10 (47.6)	23 (23.5)	33 (27.7)	
Blood transfusion given?				
Yes	4 (19.1)	9 (9.2)	13 (10.9)	0.1873
No	17 (80.9)	89 (90.8)	106 (89.1)	
Hyperparasitemia?[c]				
Yes	1 (4.8)	35 (35.7)	36 (30.3)	0.0051
No	20 (95.2)	63 (64.3)	83 (69.7)	

Notes: [a]Z-test for two-sample proportions; [b]the proportion based on the number of blood smear tests ordered by clinicians; [c]"numerous" or "+++" or more recorded in the patient's folder or on the laboratory result.
Abbreviations: RDT, rapid diagnostic test; PCV, packed cell volume; HB, hemoglobin.

The most commonly prescribed parenteral medication for severe malaria in facilities was intramuscular artemether (60.4%). Intravenous artesunate, intramuscular arteether, and intravenous quinine were used in about the same frequency (Figure 1).

Discussion

The findings of this audit indicate that the management of severe malaria in secondary health facilities in Cross River State is below the level recommended in the national treatment policy.[3,15] Health practitioners in public facilities complied better with national guidelines than those in private facilities. The age and sex of patients were well documented in both public and private facilities but body weight and temperature were not. Although not all the children treated with parenteral antimalarial drugs were weighed, the audit showed that the health care providers made fairly accurate prescriptions of parenteral antimalarials for some of the children based on their age.

Table 3 Treatment received by patients

Treatment modalities	Patients n (%)			*P*-value[a]
	Public	Private	Total	
Parenteral treatment given?				
Yes	19 (90.5)	77 (78.6)	96 (80.7)	0.2099
No	2 (9.5)	17 (17.3)	19 (16)	
Unclear	–	4 (4.1)	4 (3.3)	
Appropriate dose received (parenteral treatment only)?				
Dose appropriate[b]	11 (57.9)[b]	46 (46.9)	57/96 (59.4)	0.3601
Wrong dose	8 (42.1)	31 (53.1)	39/96 (40.6)	
Oral continuation therapy (with ACT)?				
Yes	13 (61.9)	34 (34.7)	47 (39.5)	
No	7 (33.3)	57 (58.2)	64 (53.8)	0.0207
Unclear	1 (4.8)	7 (7.1)	8 (6.7)	

Notes: [a]Z-test for two-sample proportions; [b]the proportion based on the number of patients who received parenteral treatment.
Abbreviations: ACT, artemisinin-based combination therapy.

This audit revealed that confirmation of the diagnosis of malaria in children was below the national target of at least 80%,[15] and that more cases were confirmed by microscopy than RDT. Possible reasons for not confirming the diagnosis might include inadequate skilled manpower, and inadequate power supply to perform microscopy and Hb estimations in some of the facilities. RDT was sparingly done because the kits were not available in most public facilities. The reason why relatively more RDTs were requested in public facilities but more tests were performed in private facilities could be attributable to cost of the service. Given that care is provided at fee-for-service basis in the country. Patients that patronize private facilities are more likely to afford the fees than those that attend public facilities. To improve confirmation of the diagnosis of malaria, machinery that will ensure constant availability of RDT kits in facilities is essential since highly skilled personnel or power supply are not required for their use.

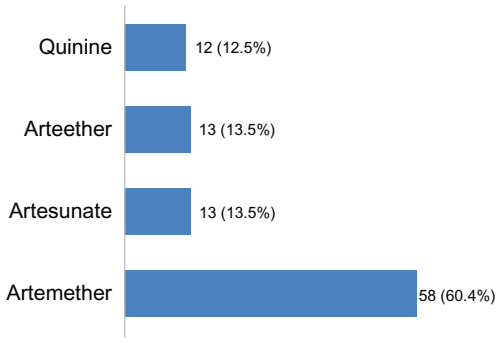

Figure 1 Prescription pattern for parenteral medications.

In this audit, parenteral artemether was used in treating 60.4% of patients with severe malaria while parenteral artesunate – which is currently recommended as first-line therapy for severe malaria – was used in only 13% of cases. Before the implementation of the current policy, intravenous quinine infusion, or alternatively intramuscular artemether, were used for treating severe malaria. Unlike quinine, the dosage schedule for the administration of parenteral artemether is simpler and partly explains its preference by most practitioners. Since the dosage schedule of parenteral artesunate allows more flexibility of use than artemether, it would appear that either many prescribers might not be up to date with the new policy or that parenteral artesunate is not available in many facilities.

The audit also revealed that more practitioners in public facilities prescribed ACT after the discontinuation of parenteral drugs than in private facilities. Since more emphasis has been laid on the completion of treatment of severe malaria with ACTs after the discontinuation of parenteral treatment in the revised policy, it would appear that practitioners in public facilities maybe aware of the fact that ACTs should be given after parenteral drugs but nonavailability of commodities in facilities remains an issue.

Referrals of cases of severe malaria from primary to secondary facilities were not documented in patient case files. Since it is routine practice to document drug treatments administered from referring centers, it appears that many patients with severe malaria were probably being managed inappropriately in primary health facilities against the recommendation of the national policy, which states that severe malaria be managed in secondary or tertiary centres.[3] The fact that some of the data extracted from the patients' case records were not quite legible is a limitation of this audit.

Conclusion

This study highlights the serious challenges faced in the management of severe malaria in a resource-limited setting like Nigeria. There is a need for the provision of RDT kits in facilities as well as for the training and retraining of prescribers on updated policy guidelines for proper case management of severe malaria.

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Disclosure

The authors report no conflicts of interest in this work.

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